

REMARKS

Claims 1 – 23 are pending in the application.

Claims 1-5, 8-12, 18-23 are rejected.

Claims 6 and 7 are objected to as being dependent upon a rejected base claim, but would be allowable if re-written in independent form including all of the limitations of the base claim and any intervening claims. Claims 13-17 are allowed.

Claims 24-26 are newly added. Applicant submits that the amendments are fully supported by the patent specification and do not add any new matter.

Support for the newly added claims 24- 26 for articles made by the methods of the inventions can be found in the specification, including but not limited to paragraphs 33, 34, for articles in the form of tubing or rod, and 36 for articles made in the form of an optical fiber perform.

Claims 27 - 28 are newly added. These claims are the original claims 6 and 7 which were allowed by the Examiner, written in independent form including all of the limitations of the base claim and any intervening claims.

35 U.S.C. § 102(b) rejection –US Pat. No. 4,515,612 to Burrus Jr. et al. The Examiner rejects claims 1, 3-5, 8-10, 12, 18 and 22-23 under 35 USC 102(b) as anticipated by Burrus. The Examiner indicates that Burrus discloses a method of optical fiber perform fabrication comprising deuterium / hydrogen exchange, specifically “exposing the unconsolidated deposit to an atmosphere containing deuterium to permit the deuterium to diffuse through out the deposited perform...”

Applicant respectfully traverses the Examiner’s rejection that Burrus anticipates the invention. To anticipate a claim, a reference must disclose each and every element of the claim. *Lewmar Marine v. Variant Inc.*, 3 U.S.P.Q.2d 1766 (Fed. Cir. 1987).

The invention relates to a method for forming quartz articles comprising a number of steps, including ***fusing a feed material of essentially pure silicon dioxide*** in a melting zone of a furnace under a gas atmosphere comprising a molecular deuterium gas, and ***then drawing finished elongated fused article from the fused quartz feed material.***

Burrus discloses methods to fabricate optical fiber and optical fiber performs “subsequent to the formation of the silica.” (Burrus, Abstract), with the objects of lowering fiber loss and “reduction in thickness, or elimination of the H-diffusion barrier layer or ... reduction of the thickness of the deposited cladding layer” (Burrus, Summary of the Invention). Burrus specifically relates to treating in an atmosphere consisting essentially of deuterium, already formed articles, e.g., silica-based optical fibers and optical fiber performs.

Applicant respectfully submits that Burrus neither discloses nor suggest a process for forming a quartz article by fusing raw quartz materials in a gas furnace comprising a D2 gas and drawing the quartz article from the furnace. As Burrus does not expressly or inherently teach the

claimed invention, Applicant respectfully requests the reconsideration and withdrawal of the rejection of the claim invention under 35 U.S.C. § 102(b) over Burrus.

35 U.S.C. § 103(a) rejection –US Pat. No. 4,515,612 to Burrus Jr. et al – claims 11 & 19 The Examiner rejects claim 11 and 19 under 35 USC 103(a) as unpatentable over Burrus Jr. et al. The Examiner indicates that Burrus' objective is to exchange H₂ for D₂, thus a low H₂ concentration would be expected in claim 11. Additionally, the partial pressure of deuterium should be at least 10 Torr, and that it would be obvious to one of ordinary skill that the use of inert gas in claim 19 would reduce unwanted by-products.

In assessing obviousness, the claimed invention must be compared to that which would have been suggested by a reference. The suggestion must be found in the reference, and the claimed invention cannot be used as a roadmap to guide choices. *In re Fine*. 5 USPQ 2d 1596 (Fed. Cir. 1988).

In the Burrus process of D₂/H₂ exchange in silica-based optical fibers and performs, “[s]ignificant loss reduction typically can be obtained in material containing more than about 0.1 ppm of hydrogen but the process can be used with material of even lower hydrogen content.” (Burrus, Summary of the Invention, column 2, lines 28-30). Burrus indicates that “[b]y ‘substantial’ exchange we mean measurable exchange, typically of the order of 10% or more, or incorporation of about 0.1 ppm of OD, whichever is less.” (Burrus, column 3, lines 24-27).

As indicated above, Burrus relates to D₂/H₂ exchange in formed quartz articles (fibers and performs) with a starting H₂ level of 0.1 ppm or 5×10^{-8} mol/g, with the expectation of a “substantial exchange” or reduction of H₂ of 10% or more. This means that a finished article such as an optical fiber with a starting H₂ level of 0.1 ppm will have a H₂ level of 0.09 ppm or less at the end of the Burrus process. On the other hand, claim 11 of the present invention relates to a **finished** quartz article in the form of a deposition tube having a H₂ content of 5×10^{-11} mol/g to 5×10^{-8} mol/g.

With respect to claim 19, Applicant respectfully submits that Burrus neither discloses nor suggests the use of inert gas. The Examiner has not explained why the use of the inert gas would be obvious, except through the application of hindsight.

For the foregoing reasons, Applicant submits that the rejection of claims 11-19 fails to meet the legal standards for a rejection under 35 USC § 103. The reversal of the rejection is therefore urged.

35 U.S.C. § 103(a) rejection –US Pat. No. 4,515,612 to Burrus Jr. et al – claims 2 & 20-21 The Examiner further rejects Claims 2 and 20-21 as obvious over Burrus, for the reason that: “Thus, it is clearly shown, that a method of making an optical fiber using a tube as disclosed by Burrus, is directed to using the rod-in-tube method for manufacturing an optical fiber.” According to the Examiner, “it would be obvious to one of ordinary skill in the art to collapse Burrus’ tube in a H₂ free environment since it is Burrus’ main objective to prevent H₂ from diffusing into the silica glass, “

As previously indicated, Burrus relates to a process for treating fibers and performs, e.g., already formed articles such as fiber, rods, tubes, etc., and NOT raw silica material, in an

atmosphere consisting substantially of deuterium, for a "substantial exchange" or reduction of H₂ of 10% or more. The Examiner further asserts: "the claimed heat treatment for the fused silica article (deemed as Burrus' manufactured tube) would occur when the tube is being collapsed onto the rod."

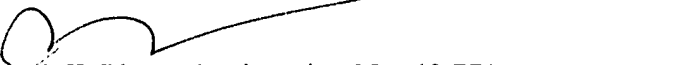
First of all, the article of claims 2, 20-21 of the invention can be of any form, e.g., a tube, a rod, a draw cane, and the like. Secondly, Applicant respectfully directs the Examiner's attention to paragraphs 33 - 34 of the specification, wherein the heat treatment process of the invention is described and that: "Baking reduces the amount of hydrogen-bearing species in the formed tubing by a factor of 100 or about 0.015 ppm." It should be further noted that the heat treatment step in claims 2 and 20-21 is AFTER the process of fusing quartz materials in a gas furnace atmosphere comprising deuterium, and drawing the fused quartz to form the elongated article. The substantial reduction is in contrast with the D₂ / H₂ exchange process in Burrus, wherein "[b]y 'substantial' exchange we mean measurable exchange, typically of the order of 10% or more, or incorporation of about 0.1 ppm of OD, whichever is less." (Burrus, column 3, lines 24-27).

Applicant respectfully submit that there is no suggestion or teaching in Burrus to heat-treat performs AFTER the Burrus D₂ / H₂ exchange process, to further reduce the H₂ bearing species in the formed article. Therefore, reconsideration and withdrawal of the rejection of claims 2, 20-21 under 35 U.S.C. § 103(a) over Burrus is requested.

CONCLUSION. In view of the foregoing amendments and remarks, Applicants respectfully request reconsideration of this application and the timely allowance of the pending claims.

Respectfully submitted,

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